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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,266	11/17/2006	Alessandro Casalini	282367US0X PCT	5853

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EXAMINER	
SALVITTI, MICHAEL A	

ART UNIT	PAPER NUMBER
1796	

NOTIFICATION DATE	DELIVERY MODE
10/07/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/561,266	CASALINI ET AL.	
	Examiner	Art Unit	
	MICHAEL A. SALVITTI	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 August 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-36* is/are rejected.

7)☒ Claim(s) *18-24 and 30-36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 31, 2009 has been entered.

Claim Objections

Claims 21 and 33 objected to because of the following informalities: Both claims contain the typo "with respect to the *totals* weight". Appropriate correction is required.

Claims 18-24 and 30-36 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 18-24 and 30-36 are directed to compositions. Their parent claims are directed to processes (claims 17 and 29, respectively). Structural limitations on the compositions fail to limit the process steps.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 24, 27-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 27 and 28: Claims 27 and 28 require the addition of initiators and chain transfer agents, respectively. Their base claim (claim 17) recites these components as optional.

Further regarding claim 27 and 28: Claims 27 and 28 recite the limitation "monomer weight". There is insufficient antecedent basis for this limitation in the claim. It is ambiguous whether the monomer weight refers to the 1,3-alkadiene/monomer copolymer or the vinyl aromatic monomer of claim 17. For the purposes of further examination, the monomer will be interpreted as being the vinyl aromatic monomer.

Regarding claims 24 and 36: The phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d). Both claims recite: "Y is a halogen such as chlorine or bromine." For the purposes of further examination, the claim will be given the broadest reasonable interpretation, "Y is a halogen".

Regarding claims 29-36: Claim 29 recites the limitation "aqueous phase" in subsection iii. There is insufficient antecedent basis for this limitation in the claim. Water is not a required limitation in the claim, and mass-suspension polymerizations

can take place in solvents other than water. For the purposes of further examination, claim 29 will be examined as having water as a requisite limitation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 17 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al.* A table from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406) is used for supporting evidence.

Regarding claim 17: *Demirors* teaches a mass-continuous process (col. 2, lines 55-68 and col. 9, lines 15-18) for the preparation of a rubber-reinforced vinyl aromatic copolymer. This process consists of:

a.) preparing a solution of rubber particles (dissolving rubber in styrene monomers; *Demirors* col. 6, lines 55-58). The rubber comprises a bimodal mixture of polymer particles (*Demirors* col. 6, lines 23-30), which are homopolymers (100%) of 1,3 alkadienes (e.g. butadiene, isoprene, chloroprene, piperylene; *Demirors* col. 3, line 65 through col. 4, line 10).

b.) the solution is polymerized at 60-190°C in the presence of initiators (*Demirors* col. 10, lines 13-16). Chain transfer agents are taught (*Demirors* col. 10, lines 5-6).

c.) the vinyl aromatic (co)polymer is recovered (*Demirors* col. 9, lines 59-61).

The recovered rubber-reinforced vinyl aromatic (co)polymer consists of 80-98% styrene (calculated from subtraction of rubbery particles) and 2-20% rubbery particles (*Demirors* col. 5, lines 50-57). Of the rubber particles, 20-60% have "core-shell" morphology (i.e. 0.1-2 microns) and 20-60% have "salami" morphology (i.e. 2-8 microns); (*Demirors* col. 6, lines 17-22). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the ratios of the core-shell and salami particles taught by *Demirors*, with the motivation of obtaining a desirable balance of impact and tensile properties (*Demirors* col. 2, lines 13-15 and col. 5, lines 18-25).

Demirors does not teach solubility parameters δ of the rubber components nor states the rubber particles having a difference in solubility parameter δ_1-$\delta_2 \geq 0.5$. *Echte* shows impact-resistant polystyrenes containing particles of a bimodal distribution (*Echte* col. 1, lines 35-50). The particles (b1) (i.e. "core-shell") comprise 60-95% by weight polybutadiene (with styrene as the balance; *Echte* col. 1, lines 47-48 and col. 2, lines 17-20). The particles (b2) (i.e. "salami") comprise 5-40% polybutadiene, and the balance styrene (col. 1, lines 49-50). The table from *Barton* is copied below:

TABLE I
Preferred Hildebrand Parameter Values for Selected Polymers

Polymer	δ/MPa^1/2
Polyacrylonitrile	26
Polybutadiene	17.0
Poly(ethyl acrylate)	18.5
Cellulose acetate	24
Cellulose nitrate	21
Polychloroprene	18.5
Poly(dimethylsiloxane)	15.5
Ethyl cellulose	20
Polyethylene	17.0
Poly(ethylene oxide)	24
Poly(ethyl methacrylate)	18.5
Polyisobutylene	16.5
Polyisoprene	17.0
Poly(methyl acrylate)	20.5
Poly(methyl methacrylate)	19.0
Polypropylene	16.5
Polystyrene	18.5
Poly(tetrafluoroethylene)	13
Poly(vinyl acetate)	20
Poly(vinyl chloride)	19.5

On a weight-average between 5% polybutadiene and 95% styrene, the examiner calculates the "salami" particles to have a δ_1 of 18.42 ((0.05 * 17) + (0.95 * 18.5)). At 95% polybutadiene and 5% polybutadiene, the examiner calculates the "core-shell" particles to have a δ_2 of 17.075 ((0.95 * 17) + (0.05 * 18.5)). This is a difference of : δ_1-δ_2=1.345. *Demirors* and *Echte* are analogous art in that they are drawn to the same field of endeavor, namely high-impact polystyrenes utilizing bimodal 1,3-alkadiene rubbery particles. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to use the process taught by *Demirors* to incorporate rubbery particles with a difference in solubility parameter δ_1-δ_2 ≥0.5 (as taught by *Echte*), with the motivation of creating an impact-resistant styrene combining high gloss and good mechanical properties (*Echte* col. 1, lines 27-35).

Regarding claim 25: *Demirors* teaches preparing the composition in an inert solvent (col. 7, lines 10-13) present at 2-30% by weight (col. 7, lines 25-27). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the solvent between 5-20% by weight, with the motivation of managing the processability and heat transfer during polymerization (col. 7, lines 20-25).

Regarding claim 26: *Demirors* teaches a range of polymerizations ranging from 60-190°C, and is variable dependent on the initiator (col. 10, lines 13-16). High-temperature polymerizations are known to cause undesirable effects such as side-reactions and lower molecular weights, leading to an undesirable product (MPEP § 2144.02). At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the reaction temperature below 100°C, with the motivation of obtaining a high-molecular weight resin exhibiting fewer side-products.

Regarding claim 27: *Demirors* teaches initiators added in a quantity of 100-1,500 ppm of initator by weight of the polymer (0.01-0.15%; col. 8, lines 37-47).

Regarding claim 28: *Demirors* teaches 0.001-0.5% chain transfer agent (col. 10, lines 5-13).

Claims 18-24 have been examined as product-by-process claims, using limitations directed to the product.

Claims 18-19 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,493,922 to *Echte et al.* A table from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406) is used for supporting evidence.

Regarding claims 18-19: *Echte* teaches a rubber-reinforced vinyl-aromatic copolymer (col. 1, lines 7-12). This polymeric material comprises a vinyl aromatic polymer matrix (polystyrene) from 70-97% (col. 1, lines 41-43), and bimodal particles consisting of:

1.) "core-shell" particles (0.2-0.6 μm; col. 1, lines 47-48) 60-95% wt. (col. 2, lines 4-5)

2.) "salami" particles (2-8 μm; col. 1, lines 49-50) at 5-40% wt. (col. 2, lines 27-30).

Both rubber additives are comprised of copolymers of 1,3-alkadienes (polybutadiene/polystyrene; col. 1, lines 41-46). *Echte* does not explicitly state the solubility parameter δ_1-$\delta_2 \geq 0.5$; however, this calculation has been demonstrated as being an inherent property in the rejection of claim 17 above. The instant application and *Echte '922* show substantially overlapping ranges regarding particle size. In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the particle size, with the motivation of enhaincing the glossiness and mechanical properties (*Echte* col. 1, lines

27-30), which are directly dependent on the particle morphologies (*Echte* col. 1, lines 30-35).

Regarding claim 24: *Echte* teaches polystyrene (col. 1, line 39), wherein R is hydrogen and n is zero.

Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,493,922 to *Echte et al.* and "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton*, as applied to claim 18 above, further in view of U.S. Patent No. 6,545,090 to *Demirors et al.*

Regarding claim 20: *Echte* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 18, as set forth above.

Echte is silent regarding the molecular weights of S-B type polymers. *Demirors* teaches elastomeric products (rubbers) having a polystyrene block having an average molecular weight between 60,000-80,000 (*Demirors* col. 5, lines 8-17), and a polybutadiene having an average molecular weight between 100,000-1,000,000 (*Demirors* col. 4, lines 1-10). These references are analogous art in that they are drawn to the same field of endeavor, namely the synthesis of impact-resistant polystyrenes, via blends of rubbery particles added to a polystyrene matrix. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to incorporate elastomers with molecular weights in these ranges, as taught by *Demirors* into the composition of *Echte*, with the motivation of optimizing the Mooney viscosities of the

resultant polymers (*Demirors*, col. 4, lines 11-24). Optimized viscosity enables a person having ordinary skill in the art to improve the processing parameters, resulting in an improved product.

Regarding claim 21: *Echte* in combination with *Demirors* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 20, as set forth above.

Echte is silent regarding the ratio of styrene to butadiene present in the S-B type polymer. *Demirors* teaches a styrene block with 20-80% by weight of the copolymer (*Demirors* col. 5, lines 18-24). At the time of the invention, it would have been obvious to a person having ordinary skill in the art incorporate 10-50% by weight styrene block copolymers into the invention of *Echte*, with the motivation of obtaining the proper proportions of small and large rubber particles (*Demirors*, col. 5, lines 18-20), which is stated to result in a good combination of impact resistance, tensile strength and surface gloss (*Demirors* col. 6, lines 5-30).

Regarding claim 22: *Echte* in combination with *Demirors* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 21, as set forth above.

Echte is silent regarding the styrene content equal to 40% by weight and a viscosity in solution ranging from 30-50 cPs. *Demirors* teaches a styrene-butadiene block copolymer having a styrene content ranging from 20-80% (*Demirors* col. 5, lines 18-25), having a viscosity measured at 40-400 cps (*Demirors* col. 5, lines 25-35). At the time of the invention, it would have been obvious to a person having ordinary skill in the

art to prepare the polymer composition of *Echte* with the parameters taught by *Demirors*, with the motivation of obtaining a high-impact polystyrene composition which is sufficiently solid to be handled and processed in a normal fashion (*Demirors* col. 5, lines 40-42).

Regarding claim 23: *Echte* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 18, as set forth above.

Echte is silent regarding the elastomeric product as polyisoprene, with a viscosity of 100-1000 cPs. *Demirors* teaches isoprenes as a preferred 1,3 conjugated diene (*Demirors* col. 3 line 65 through col. 4, line 10). Viscosities below 300 centipoise are taught (col. 4, lines 12-24). At the time of the invention, it would have been obvious to a person having ordinary skill in the art to use a polyisoprene elastomer with a viscosity ranging from 100-1000 cps, with the motivation of obtaining a high-impact polystyrene composition which is sufficiently solid to be handled and processed in a normal fashion (*Demirors* col. 5, lines 40-42).

Claims 29 and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al.* A table from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406) is used for supporting evidence.

Regarding claim 29: *Demirors* teaches a mass-suspension process (col. 5, lines 25-30) for the preparation of a rubber-reinforced vinyl aromatic copolymer. This process consists of:

i.) preparing a solution of rubber particles (dissolving rubber in styrene monomers; col. 6, lines 55-58). The rubber comprises a bimodal mixture of polymer particles (col. 6, lines 23-30), which are homopolymers (100%) of 1,3 alkadienes (e.g. butadiene, isoprene, chloroprene, piperylene; col. 3, line 65 through col. 4, line 10).

ii.) the solution is polymerized at 60-190°C in the presence of initiators (col. 10, lines 13-16). Chain transfer agents are taught (col. 10, lines 5-6). Phase inversion occurs during the polymerization (col. 7, lines 29-55), and the period of time wherein polymerization is occurring prior to this is analogous to the phrase "pre-polymerization" in the recited claim.

iii.) polymerization continues after phase inversion (col. 7, line 55 through col. 8, line 17). Suspension agents are added (col. 9 line 62 through col. 10, line 5).

The recovered rubber-reinforced vinyl aromatic (co)polymer consists of 80-98% styrene (calculated from subtraction of rubbery particles) and 2-20% rubbery particles (col. 5, lines 50-57). Of the rubber particles, 20-60% have "core-shell" morphology (i.e. 0.1-2 microns) and 20-60% have "salami" morphology (i.e. 2-8 microns); (col. 6, lines 17-22).In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the

ratios of the core-shell and salami particles, with the motivation of obtaining a desirable balance of impact and tensile properties (col. 2, lines 13-15 and col. 5, lines 18-25).

Demirors does not teach solubility parameters δ of the rubber components nor states the rubber particles having a difference in solubility parameter δ_1-$\delta_2 \geq 0.5$. *Echte* shows impact-resistant polystyrenes containing particles of a bimodal distribution (col. 1, lines 35-50). The particles (b1) (i.e. "core-shell") comprise 60-95% by weight polybutadiene (with styrene as the balance; col. 1, lines 47-48 and col. 2, lines 17-20). The particles (b2) (i.e. "salami") comprise 5-40% polybutadiene, and the balance styrene (col. 1, lines 49-50). The table from *Barton* is copied below:

TABLE I
Preferred Hildebrand Parameter Values for Selected Polymers

Polymer	δ/MPa^1/2
Polyacrylonitrile	26
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Cellulose nitrate	21
Polychloroprene	18.5
Poly(dimethylsiloxane)	15.5
Ethyl cellulose	20
Polyethylene	17.0
Poly(ethylene oxide)	24
Poly(ethyl methacrylate)	18.5
Polyisobutylene	16.5
Polyisoprene	17.0
Poly(methyl acrylate)	20.5
Poly(methyl methacrylate)	19.0
Polypropylene	16.5
Polystyrene	18.5
Poly(tetrafluoroethylene)	13
Poly(vinyl acetate)	20
Poly(vinyl chloride)	19.5

On a weight-average between 5% polybutadiene and 95% styrene, the examiner calculates the "salami" particles to have a δ_1 of 18.42 ((0.05 * 17) + (0.95 * 18.5)). At

95% polybutadiene and 5% polybutadiene, the examiner calculates the "core-shell" particles to have a δ_2 of 17.075 ((0.95 * 17) + (0.05 * 18.5)). This is a difference of :

δ_1-δ_2=**1.345**. This is a sample calculation using the parameters taught by *Echte*; less extreme values of the polybutadiene/polystyrene ratio, within the claimed ranges of *Echte* would show a difference larger than 0.5, and all values between 0.5-1.345 can be achieved. *Demirors* and *Echte* are analogous art in that they are drawn to the same field of endeavor, namely high-impact polystyrenes utilizing bimodal 1,3-alkadiene rubbery particles. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to use the process taught by *Demirors* to incorporate rubbery particles with a difference in solubility parameter δ_1-δ_2 ≥0.5 (as taught by *Echte*), with the motivation of creating an impact-resistant styrene combining high gloss and good mechanical properties (col. 1, lines 27-35).

Regarding claim 37: *Demirors* teaches preparing the composition in an inert solvent (col. 7, lines 10-13) present at 2-30% by weight (col. 7, lines 25-27). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the solvent between 5-20% by weight, with the motivation of managing the processability and heat transfer during polymerization (col. 7, lines 20-25).

Regarding claim 38: *Demirors* teaches a range of polymerizations ranging from 60-190°C, and is variable dependent on the initiator (col. 10, lines 13-16). High-

temperature polymerizations are known to cause undesirable effects such as side-reactions and lower molecular weights, leading to an undesirable product (MPEP § 2144.02). At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the reaction temperature below 100°C, with the motivation of obtaining a high-molecular weight resin exhibiting fewer side-products.

Regarding claim 39: *Demirors* teaches the polymerization occurring in a stirred-tank reactor (col. 9, line 39). The absence of added pressure means that the polymerization occurs at 1.01 bar (atmospheric pressure). Temperature ranges varying between 60 and 190°C are taught (col. 10, lines 13-16). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the reaction temperature below 100°C, with the motivation of obtaining a high-molecular weight resin exhibiting fewer side-products.

Claims 30-36 have been examined as product-by-process claims, using limitations directed to the product.

Claims 30-31 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,493,922 to *Echte et al.* A table from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406) is used for supporting evidence.

Regarding claims 30-31: *Echte* teaches a rubber-reinforced vinyl-aromatic copolymer (col. 1, lines 7-12). This polymeric material comprises a vinyl aromatic polymer matrix (polystyrene) from 70-97% (col. 1, lines 41-43), and bimodal particles consisting of:

1.) "core-shell" particles (0.2-0.6 μm; col. 1, lines 47-48) 60-95% wt. (col. 2, lines 4-5)

2.) "salami" particles (2-8 μm; col. 1, lines 49-50) at 5-40% wt. (col. 2, lines 27-30).

Both rubber additives are comprised of copolymers of 1,3-alkadienes (polybutadiene/polystyrene; col. 1, lines 41-46). *Echte* does not explicitly state the solubility parameter δ_1-$\delta_2 \geq 0.5$; however, this calculation has been demonstrated as being an inherent property in the rejection of claim 17 above. The instant application and *Echte '922* show substantially overlapping ranges regarding particle size. In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the particle size, with the motivation of enhaincing the glossiness and mechanical properties (*Echte* col. 1, lines 27-30), which are directly dependent on the particle morphologies (*Echte* col. 1, lines 30-35).

Regarding claim 36: *Echte* teaches polystyrene (col. 1, line 39), wherein R is hydrogen and n is zero.

Claims 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,493,922 to *Echte et al.* and "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton*, as applied to claim 30 above, further in view of U.S. Patent No. 6,545,090 to *Demirors et al.*

Regarding claim 32: *Echte* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 30, as set forth above.

Echte is silent regarding the molecular weights of S-B type polymers. *Demirors* teaches elastomeric products (rubbers) having a polystyrene block having an average molecular weight between 60,000-80,000 (*Demirors* col. 5, lines 8-17), and a polybutadiene having an average molecular weight between 100,000-1,000,000 (*Demirors* col. 4, lines 1-10). These references are analogous art in that they are drawn to the same field of endeavor, namely the synthesis of impact-resistant polystyrenes, via blends of rubbery particles added to a polystyrene matrix. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to incorporate elastomers with molecular weights in these ranges, as taught by *Demirors* into the composition of *Echte*, with the motivation of optimizing the Mooney viscosities of the resultant polymers (*Demirors*, col. 4, lines 11-24). Optimized viscosity enables a person having ordinary skill in the art to improve the processing parameters, resulting in an improved product.

Regarding claim 33: *Echte* in combination with *Demirors* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 32, as set forth above.

Echte is silent regarding the ratio of styrene to butadiene present in the S-B type polymer. *Demirors* teaches a styrene block with 20-80% by weight of the copolymer (col. 5, lines 18-24). At the time of the invention, it would have been obvious to a person having ordinary skill in the art incorporate 10-50% by weight styrene block copolymers into the invention of *Echte*, with the motivation of obtaining the proper proportions of small and large rubber particles (*Demirors*, col. 5, lines 18-20), which is stated to result in a good combination of impact resistance, tensile strength and surface gloss (col. 6, lines 5-30).

Regarding claim 34: *Echte* in combination with *Demirors* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 33, as set forth above.

Echte is silent regarding the styrene content equal to 40% by weight and a viscosity in solution ranging from 30-50 cPs. *Demirors* teaches a styrene-butadiene block copolymer having a styrene content ranging from 20-80% (col. 5, lines 18-25), having a viscosity measured at 40-400 cps (col. 5, lines 25-35). At the time of the invention, it would have been obvious to a person having ordinary skill in the art to prepare the polymer composition of *Echte* with the parameters taught by *Demirors*, with the motivation of obtaining a high-impact polystyrene composition which is sufficiently solid to be handled and processed in a normal fashion (col. 5, lines 40-42).

Regarding claim 35: *Echte* teaches the rubber-reinforced vinyl aromatic copolymers containing rubbery styrene-butadiene copolymers of claim 30, as set forth above.

Echte is silent regarding the elastomeric product as polyisoprene, with a viscosity of 100-1000 cPs. *Demirors* teaches isoprenes as a preferred 1,3 conjugated diene (col. 3 line 65 through col. 4, line 10). Viscosities below 300 centipoise are taught (col. 4, lines 12-24). At the time of the invention, it would have been obvious to a person having ordinary skill in the art to use a polyisoprene elastomer with a viscosity ranging from 100-1000 cps, with the motivation of obtaining a high-impact polystyrene composition which is sufficiently solid to be handled and processed in a normal fashion (col. 5, lines 40-42).

Response to Arguments

The following responses are directed to the document entitled "Remarks/Arguments" received on August 21, 2009.

A) The applicant argues (bottom paragraph of page 10 through top of page 11) that the previous rejection under 35 U.S.C. § 103(a) over *Echte* (USPN 4,493,922) and *Kasahara et al.* (USPN 5,039,714) does not disclose or suggest polymerization of a monomer solution containing both types of reinforcing particles, and that the solubility parameter relationship: $\delta_1-\delta_2 \geq 0.5$

In response, the previous claims were directed to a product, not a process, and the *Echte* prior art was applied as such. This is a moot point since that the claims have

been rewritten in product-by-process language. In response to the argument that the solubility parameter relationship has not been established, the Examiner has found more support (*Barton*) in favor of inherency (see rejection of claim 17 above for reasoning). *Kasahara* has been removed as a reference, since it was an evidentiary reference used to equate the terminology of "salmai particle" to the capsule particles of *Echte*.

B) Applicant argues (top paragraph of page 11) that *Echte* teaches particles of different morphology.

In response, *Echte* teaches particles of strictly bimodal morphology (col. 1, lines 46-50), as per the definition in the instant specification (an absence of particles between the "core-shell" and "salami" particle sizes; page 1, line 10 to page 2, line 1of instant spec). These particles have substantially overlapping size ranges with the requisite limitations of the instant recited invention.

C) Applicant argues (second paragraph on page 11 to mid-page 12) that *Demirors* (USPN 6,545,090) is silent regarding the solubility parameter relationship, and does not teach bimodal distribution of particles.

In response, *Demirors* sets forth methods of creating high-impact polystyrene with bimodally distributed rubber particles. The motivation for providing copolymers satisfying the relationship $\delta_1-\delta_2 \geq 0.5$ is taught by *Echte*, and set forth in the Action above. *Demirors* teaches bimodal particles with significant overlap of the instant recited ranges (col. 6, lines 23-30).

D) Applicant argues (mid-page 12 to page 13) that the combination of references do not teach every limitation.

In response, the previous Action relied on inherency of the difference of solubility parameters for the rubbers taught by *Echte*. Further support of this inherency is provided (see claim 17 rejection and point "A" above). "The discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art's functioning, does not render the old composition patentably new to the discoverer." *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347, 51 USPQ2d 1943, 1947 (Fed. Cir. 1999). See MPEP § 2112.

Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- WO2004/005397 teaches impact-resistant vinyl aromatic polymers comprising dispersed rubber particles.
- US 5,959,033 teaches vinyl aromatic polymer matrices comprising polybutadiene particles of at least 2 different sizes (claims 1, 9 and 10).
- US 6,441,090 teaches rubber-modified monovinylidene aromatic polymers having bimodal particles size distribution.
- US 5,179,166 teaches monovinylidene aromatic polymer resins with specific rubber particle size distributions, present in overlapping size ranges with the instant application.

- US 5,985,997 teaches a process for making bimodal rubbery HIPS.
- US 6221,471 teaches HIPS with rubbery particles of two size distributions.
- US 5,294,656 teaches HIPS with small and large-sized rubbery particles.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL A. SALVITTI whose telephone number is (571)270-7341. The examiner can normally be reached on Monday-Thursday 8AM-7PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Eashoo can be reached on (571) 272-1197. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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